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MI). Polystyrene substrates were purchased from NUNC (Rochester, NY). Rabbit, anti-rabbit and mouse immunoglobulin G (IgG) were purchased from Sigma (St-Louis, MO), and Alexa-488 donkey anti-sheep IgG was obtained from Molecular Probes (Eugene, OR). A hand-operated vacuum pump and polyethylene tubing (Intramedic PE-60, 0.76 mm internal diameter and 1.22 mm external diameter) were purchased from VWR Scientific Products (Pittsburgh, PA). All other chemicals were of analytical grade and are available from chemical supply houses.

Preparation of a microfluidic platform –

A PDMS replica with microchannels was prepared by rapid prototyping as described in U.S. Patent No. 6,645,432 and in Samuel Sia et al, PCT application titled "Assay Device and Method," filed December 29, 2004 PCT/US04/43585 ~~under attorney docket no. H0498.70211~~, both of which are incorporated by reference in their entireties herein. A microfluidic design was used to pattern stripes of antigen (two parallel channels, 30-mm long, 200-μm wide and 60-μm deep), and a second design was used to carry out the immunoassay (six parallel channels 50-mm long, 63-μm deep). These channels were composed of 5 sections of 10 mm each, with a width of 500 μm next to the inlet and outlet, 50 μm in the center (where the heterogeneous immunoassay takes place) and 250 μm in the intermediary segments. This geometry results in long channels (i.e. where the six inlets and six outlets can be geometrically separated from each other) with a limited resistance to flow (i.e. where fluids can be pumped in a hydrodynamic flow with a minimal pressure drop). The PDMS replica for patterning was sealed non-permanently (i.e. without plasma oxidation) to the polystyrene substrate and the two parallel channels were filled with a solution of 50 μg rabbit IgG and a solution of 50 μg mouse IgG solution in PBS. After a 90-minute incubation time at room temperature, the channels were emptied and rinsed twice with a fresh solution of 0.05% Tween in PBS. The PDMS slab was pealed off and the polystyrene substrate was rinsed with deionized water (conductivity larger than 18 MΩ) and dried with a nitrogen gun. Inlets and outlets were punched out in the second PDMS slab (for the immunoassay) using a sharpened medical needle with an outside diameter of 1.6 mm (gauge 16G1½). The holes left in the PDMS by this modified needle were large enough to insert PE-60 tubing and allowed a thigh seal between the cartridge and the microchannel. The second PDMS slab was non-permanently sealed onto the polystyrene substrate, with its microchannels oriented

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In one aspect, the invention may be used to provide a series of fluids to a device such as a microfluidic device. The microfluidic device may be one of those described herein or may be any other microfluidic device. An example of such a microfluidic device is described in Samuel Sia, et al, PCT application titled "Assay Device and Method," filed December 29, 2004 ~~under attorney docket no. H0498.70211~~ PCT/US04/43585 and which is incorporated by reference herein. Fluids may be flowed in series to a reaction site in a microfluidic assay. The fluids may be gases, aqueous liquids, or non-aqueous liquids. Fluids and fluid components may include, for example, reagents, rinses, pre-rinses, fixatives and stains. The fluids may be flowed to one or more reaction sites with little or no mixing between different reagents. A series of rinse solutions may be separated by a separation plug, allowing a first rinse solution to pass completely over a reaction site before a second rinse solution is applied to the site.

In one aspect, a vessel is provided to contain, store, protect and/or transport two or more fluids. As used herein, vessels include cartridges and tubes. A vessel may contain two or more distinct fluids separated by a third fluid that is immiscible with both. Any number of distinct fluids may be contained in a vessel. For example, FIG. 12 illustrates in longitudinal cross-section an embodiment where the vessel is a tube 10 that includes a reagent solution plug 20 followed by an air plug 30, followed by a rinse solution plug 40. An additional air plug 50 may separate the first rinse solution plug 40 from a second rinse solution plug 60. The ends of the tube 70 and 72 may be sealed, for example, to retain the plugs and to prevent contamination from external sources. The liquid plugs may retain their relative positions in the tube and may be prevented from contacting each other by the interspaced air plugs. The tube dimensions and materials of construction may be chosen to help fluid plugs retain their position and remain unmixed.

Reagents and other fluids may be stored for extended lengths of time in the vessel. For example, reagents may be stored for greater than 1 day, 1 week, 1 month or 1 year. By preventing contact between fluids, fluids containing components that would typically react or bind with each other are prevented from doing so, while being maintained in a continuous chamber.

Fluids may be transferred from the vessel to be used in a process, for example, to participate in a reaction or assay. Fluids may be transferred from the vessel by applying pressure or vacuum after removing or piercing the seal at ends 70 and 72. In other